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Analysis

Investigating fishers' preferences for the design of marine Payments for Environmental Services schemes

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ABSTRACT

We determine the effects of various management restrictions on adoption rates of marine Payments for Environmental Services (PES) schemes. Choice experiments are used in order to determine how fisher participation rates change under different marine PES programme designs. Various designs, with differing restriction rates, show different rates of adoption. However, fishers show a high utility loss associated with any move away from the current management situation, irrespective of restriction levels. This indicates that PES scheme costs may be high and creating an enabling environment could be important to reducing perceived losses, as could investment into conditional in-kind compensation mechanisms. The paper also shows choice experiments to be a useful tool in marine PES design.

1. Introduction

In the past decade Payments for Environmental Services (PES) have attracted increasing interest as an innovative conservation instrument. PES seek to address market failures whereby environmental services are not attributed their true value, and increase investment into resource conservation. More specifically, PES attempt to capture those economic benefits derived from environmental services, such as clean water, and channel them back to the ecosystem managers who frequently benefit less from resource conservation than alternative land uses (Engel et al., 2008; Pagiola et al., 2005).

PES are defined as a voluntary agreement between a service provider and a service buyer (Wunder, 2005). Inducing participation is central to the success of PES as a policy instrument: potential service providers must voluntarily agree to enrol in any programme design (Newton et al., 2012).

Studies relating to PES participation have increased in the past few years. These have mainly been limited to the study of design factors which improve cost-efficiency (Petheram and Campbell, 2010), as well as the implications project design can have on equality across stakeholder participation (e.g. Zilberman et al., 2008). More recently, the literature has looked towards addressing the need to understand potential providers' willingness to participate in PES (Newton et al., 2012; Gong et al., 2010; Ma et al., 2010; Petheram and Campbell, 2010; Zbinden and Lee, 2005). However, these studies have mostly concentrated on describing endogenous individual and household determinants influencing adoption or non-adoption of PES schemes by service providers. Whilst such information can be useful in targeting households and/or communities for PES interventions, these factors are often inflexible and of limited service to policy makers (Ruto and Garrod, 2009).

In practice, very few studies have considered those elements of programme design which induce service provider participation. The influence that design factors exert over a scheme's attractiveness has recently received attention within the context of agri-environmental payment schemes (AES) (Ruto and Garrod, 2009). AES have much in common with PES in that they are voluntary, incentive-based, conditional and pay for delivery of a desired landscape/land use (Dobbs and Pretty, 2008; Ferraro, 2008). These recent studies have shown that AES design can indeed influence participation of service sellers. Ruto and Garrod (2009) show that schemes which were designed to be more flexible and offered shorter contracts required lower financial incentives to induce participation. Similarly, Espinosa-Goded et al. (2010) found that those programmes which allowed the maintenance of agricultural activity and did not impose stringent restrictions on farm management were also adopted at lower contract prices. Although not directly relating to AES per se, Qin et al. (2011) found that farmers in China were highly concerned with property rights. The provision of priority rights for contract renewal significantly increased farmers' marginal willingness to pay for of existing forestland contracts.

To a greater extent, policy design can be extremely important in achieving adequate acceptance and compliance within the fishery sector and will be particularly important in rural and low-income areas

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where monitoring and enforcement efforts are often low and/or extremely complex (Lundquist and Granek, 2005; McClanahan et al., 2005; Christie, 2004). Combined local fishery and conservation goals can be achieved through the merging of diverse management measures. Closed areas and gear modifications jointly will be needed to address wider scale issues of overfishing (Worm et al., 2009). However compliance, particularly in poor and rural settings, will hinge on community acceptance of any conservation modifications. Previous interventions, principally designed with little consensus from local fishers, have largely failed because they were unable to inspire compliance (Ferse et al., 2010; Pomeroy et al., 2001) or cover the opportunity costs of these low-income communities with few alternatives (Mohammed, 2012). For this reason, understanding how local fishers' value management restrictions is of utmost importance.

Within this paper we concentrate on how the design of PES instruments can influence participation within a marine setting, a topic which, to date, remains largely unaddressed by the PES literature both terrestrially and within the marine context. This paper uses choice experiments (CE) to investigate some aspects of marine PES design. To date there is little application of CE within fisheries management (Wattage et al., 2011), or more specifically, how restriction infrastructures may lower or induce participation by local environmental providers. In doing so this paper highlights the importance of community participation and input at the earliest stages of PES design. CE is also shown as a useful tool in assessing service provider trade-offs, and ultimately for marine management design.

The paper proceeds as follows. Section 2 presents a summary of the importance of appropriate instrument design within the marine conservation setting, as well as a review of fisher preferences for management options. Section 3 presents the study area, after which Section 4 introduces the methodological background and the choice model, discusses the use of choice modelling within fisheries management and goes on to describe the choice experiment and the econometric analysis framework in detail. Results are presented in Section 5. A discussion of the findings and their policy implications is found in Section 6. Conclusions are given in Section 7.

2. Fishers and Management Schemes

Within small-scale artisanal fisheries, marine management has generally favoured regulatory solutions. Of these, the most prolific are MPAs (Agardy et al., 2003). Total prohibition of fishing is ultimately the environmentally optimal management option; evidence of environmental benefits from regulated MPAs is clear (Agardy, 2000). However, MPAs may not be the most economical, nor the more socially just. MPAs can be inefficient and ineffectual, and can further pose unrealistic and unjustifiable burdens on local low-income fishing communities (Cinner et al., 2009a). In reality, MPA success has been mixed: site-selection can favour less accessible and less degraded areas; resource use often leaks into surrounding areas; and designated areas are often too small in area to protect the wider seascape (Cinner, 2010; Lele et al., 2010; Graham et al., 2008).

Restrictions on environmentally damaging fishing gears can form another type of conservation intervention; certain fishing gears have a higher propensity over others to negatively impact the marine environment (Akpalu, 2010). The use of more destructive gear types can: increase physical damage to the substrate; capture a high proportion of juvenile fish; target species important to reef resilience and deter others from fishing sustainably (Akpalu, 2010; Cinner, 2010). As such, gear restrictions can be a further effective fisheries management tool and often receive higher support from local fishers (Cinner et al., 2009a). However, the management of artisanal fishers, including the gear they use can be difficult due to their loose, and often poor, organisation (McClanahan and Mangi, 2004).

Moving towards more sustainable fisheries often requires a reduction in effort or a switch in methods; both of which pose short-term costs on vulnerable fishers. PES have the potential to complement existing marine management instruments through the provision of short-term incentives. Where local costs are high in the initial stages of restriction measures – whether they be a spatial or gear restriction – PES can assist in compensation for loss of catch, for example. PES should not be viewed as an instrument working in isolation but one that supports current management tools.

Whilst PES may be able to address some of the immediate issues of compensation, they will still need to consider local situations and preferences in order to be successful. Fishers have been documented to hold varying preferences for conservation management restrictions (Cinner et al., 2009a; McClanahan and Mangi, 2004). Stakeholder involvement in the early stages of marine conservation development and implementation has been identified as one characteristic of successful approaches (Leslie, 2005; Lundquist and Granek, 2005). Careful consideration of the receptivity of these communities and fishers to design and implementation of conservation interventions is essential for long-term success (Christie, 2004).

Analysis of fisher trade-offs will have numerous benefits. Identification of trade-offs, and resulting design will improve adoption of conservation instrument by local actors. Furthermore, if one assumes that fishers show preferences for the PES design[1] which has the lowest utility cost to them overall, this may lead to more cost-effective PES design.

3. The Case Study: Mtwara Region, Tanzania

Tanzania's coastline supports approximately 25% of the country's 43 million strong population of which a high proportion rely on coastal fisheries as a source of food and income. Most marine extraction activities are conducted within the shallow near shore waters (Gustavson et al., 2009; Silva, 2006). As population and fisher numbers continue to increase, these coastal resources come under increasing pressure; Tanzanian marine fisheries have suffered a significant decline in biodiversity and productivity in the past three decades (Silva, 2006).

Located in the south of Tanzania, Mtwara's coastal waters are of high national and international importance. The area contains some of Tanzania's most significant biodiversity. Part of the Eastern African Marine Ecosystem (EAME), its coral reef, which extends south from neighbouring region Lindi to the Mozambican border, connects with the Mozambican Quirimbas reef system. Together these reef systems are of critical importance as sources of marine larvae and spores which disperse out to northern and southern marine ecosystems; the Southern Equatorial Current diverges in this area creating an area of high replenishment capability (Shao et al., 2003; WWF, 2004). At the same time, the area supports a large human population. With poor transport infrastructure, marginal soils and high levels of illiteracy and poverty as the norm, Mtwara's coastal community is highly dependent on marine resources. Not surprisingly this intense pressure and the use of destructive gear types have led to the degradation of the surrounding coastal waters (Gustavson et al., 2009; Malleret, 2004).

In response to increasing environmental threats and high biological significance, the Tanzanian government gazetted Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP) in 2000. However, MBREMP is effectively a multi-purpose marine park, and continues to allow fishing within its borders. Regulations within the park are essentially the same as those outside, albeit enforced more frequently. These include: prohibition of certain destructive gears such as beach seine nets and dynamite; mangrove cutting for commercial sale; and the use of nets with meshing smaller than 3 in. (Robinson et al., 2012). However, regulations have met with community resistance, both within and outside

[1] PES design is considered herein to include various levels of restrictions faced by fishers. This will include facets of MPA restriction such as area under closure as well as further restrictions placed on gear. In reality MPA design will be an integral part of PES design, whereby PES refers to the addition of a compensation mechanism to restricted extraction and/or access.